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AUTHOR	Jacobsen, Michele; Clifford, Pat; Friesen, Sharon
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ABSTRACT

The Galileo Educational Network is an innovative educational reform initiative that brings learning to learners. Expert teachers work alongside teachers and students in schools to create new images of engaged learning, technology integration and professional development. This case study is based on the nine schools involved with Galileo in 2000/2001. Field visits and interviews (n=113) with Galileo staff, school administrators, teachers and students yielded rich information about the initiative. Indicators of success include: (1) demand for Galileo Network's services; (2) corporate investment in Intelligence Online (IO); (3) satisfaction among stakeholders at each level of the initiative; (4) evidence of engaged student learning; and (5) evidence of transformed teaching practice. Essential conditions for the sustainability and growth of the Galileo Network initiative are described. Factors that both contributed to and hindered the success of the initiative are discussed. (Contains 13 references.) (Author)

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Transformational Leadership & Professional Development for Digitally Rich Learning Environments: A Case Study of the Galileo Educational Network

Dr. Michele Jacobsen
dmjacobs@ucalgary.ca
Faculty of Education
University of Calgary
Calgary, Alberta, CANADA

Dr. Pat Clifford
clifford@ucalgary.ca
Galileo Educational Network
University of Calgary
Calgary, Alberta, CANADA

Dr. Sharon Friesen
sfriesen@ucalgary.ca
Galileo Educational Network
University of Calgary
Calgary, Alberta, CANADA

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The Galileo Educational Network Association (GENA) is a continuous professional development and research organization in Alberta, Canada, that focuses on the fundamental changes to teaching and learning required by digital media and technology. GENA's expert teachers work in schools alongside teachers and students to create new images of engaged learning, technology integration and professional development. GENA works on-line to develop and share examples of innovative and high quality student work and sustains face-to-face initiatives via its website [http://www.galileo.org] and Intelligence Online (IO) professional development service. The professional development and leadership approaches of the Galileo Network are firmly grounded in current educational research, and Galileo Network members contribute to new knowledge by actively publishing and disseminating results of their efforts (Clifford & Friesen, 2001a, 2001b, 1998, 1993; Clifford, Friesen & Jacobsen, 1998; Jacobsen 2001). GENA has developed a number of strategic alliances with private, corporate, community and government organizations to generate innovative approaches and strategies for professional development. GENA is a charitable organization that began operations in 1999 in office space provided by the Faculty of Education at the University of Calgary. The Galileo Network operates autonomously from any one school district or division as it pursues a province-wide educational reform agenda. The majority of GENA's funding, both cash and in-kind, comes from a variety of government, private, corporate and institutional organizations. Each school division and/or individual school funds their participation with the Galileo Educational Network differently.

Classroom teachers need ongoing support and professional development for the effective implementation of technology for meaningful student learning. Conventional approaches to professional development for technology integration, usually short-term skill-based workshops and seminars about working the computer, do not transform pedagogy. What makes the Galileo Educational Network approach innovative is that teachers are provided with time during the school day to collaborate, to participate in professional conversations about practice, and to work with a trusted mentor who supports and extends their technology integration efforts. The professional development relationship is guided by essential principles of engaged student learning and high technology performance, and is responsive to the individual teacher's current practice and needs. Therefore, the professional development is more closely aligned with mentorship than with coaching from the side. Far from being a set model, the GENA approach is generative, flexible and responsive to the individual teacher's needs and ideas for his or her own learning. Galileo teachers start from where classroom teachers are in their development and beliefs. The individual starting point for each teacher is respected in much the same way that teachers respond to the diverse needs and capabilities of their students. Different questions and needs are honored, and projects that arise from the relationship come from the teacher's current practice, beliefs and ideas about teaching, technology and student learning.

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Transformational Professional Development

It is important to pause here, and provide operational definitions of key terms. A decade ago, Leithwood (1992) described a move towards transformational leadership, which he defined as school leaders and classroom teachers seeking meaning together as a community, and supporting individuals as they seek meaning in their professional lives. The Galileo Network's approach to transformational professional development extends this tradition by building mutually beneficial relationships at all levels of a school system at once with the goal of empowering teachers to be innovative curriculum designers, and to free teachers to author rich learning experiences with their students. Terms like empowerment and freedom are chosen deliberately to convey the vision of enfranchisement and democracy that is at the foundation of GENA's work in schools. The Galileo approach is not just about enabling, or making possible, although this is an important and powerful part of their work with educators and educational leaders. Galileo's approach to transformational professional development aims to empower teachers and school leaders to be learners themselves again, and to form supportive communities that are committed to staff and individual growth. Galileo teachers work alongside teachers to help them develop as learners themselves so that they can translate this new freedom of inquiry into the design, implementation and evaluation of meaningful, authentic and challenging learning experiences for children.

Research Context

The present evaluation of the second year of the Galileo Network's professional development initiative builds and extends upon a study conducted at three elementary schools involved with the Galileo Educational Network in 1999/2000, its first year of operations (Jacobsen, 2001). A goal of the present investigation was to expand upon findings from three schools by investigating further the relationship between teacher and student perceptions about classroom events, the role of the Galileo Network in schools, and the duty of leadership in supporting and extending professional development initiatives during the second year of operations. The study was essentially guided by two overall research objectives: (1) Evaluate the impact of effective technology integration on engaged student learning, and (2) Evaluate the impact of the Galileo Educational Network on teaching practice and transformed learning environments by evaluating the sustainability of these professional development initiatives.

Case study research methods (Merriam, 1998; Stake, 1995) were employed to identify appropriate sources of data, and gather information. Field visits were made to eight schools to observe daily classroom events and instruction, and to conduct in-depth interviews. Over one hundred interviews (n=113) were conducted with Galileo Network staff, school administrators and technical personnel, classroom teachers and students. Observations of whole class dynamics, small group collaborative work and individual student engagement in learning were made, and observation notes recorded. The 26 indicators of *engaged learning* and 22 indicators of *high technology performance* developed by the North Central Regional Educational Laboratory (2000, 1995) provided a conceptual framework through which interview and observational data was understood, analyzed and discussed.

This case study research was rarely a linear, step-by-step process that proceeded logically from data collection to analysis. Instead, "data collection and analysis is a simultaneous activity" (Merriam, 1998, p. 151). Analysis began by framing the present study in the context of first-year findings, and continued as both an iterative and recursive process with each site visit and interview. The triangulation of data and information from site visits, interviews and observations enabled researchers to analyze and report on themes, trends and understandings of the group as well as honor individual experiences and observations in a rich, thick description of the case. Interview data was evaluated using: (1) content analysis (Merriam, 1998) of themes and recurring patterns of meaning, (2) constant comparative method (developed by Glaser & Strauss, 1967, described in Merriam, 1998) to identify emergent themes and categories, and (3) narrative analysis (Merriam, 1998) to study experience via the stories that people tell and remember. Field notes, observation and reflection on site visits, photographs of learning environments provided rich data for content analysis, and also categorical aggregation and direct interpretation (Stake, 1995). Aggregation of instances that suggested trends and shared understandings of the group, along with direct interpretation of an individual's stance, contributed to the development of themes.

DISCUSSION

Initial findings that have emerged from this case study of Galileo Network's second year of operations are summarized as follows: (1) sustainability of the initiative requires a long-term relationship be established and

maintained between school teachers and Galileo teachers, (2) sustainability requires that teacher leaders who can champion the initiative be identified and cultivated; (3) the role of district and school-based leaders is vital to the effective establishment and cultivation of a inquiry-based learning environment in which teachers were prepared to take risks, and (4) indicators of success were focused on what the children could do differently, and how technology provided opportunities for learning that were previously unavailable. The context for these findings will be discussed in subsequent sections of the paper.

Transforming Pedagogy

Both philosophical and pedagogical barriers to innovation exist when teachers shift from information-transmission to designing technology-enabled, constructivist learning environments. When teaching roles change from content expert to designer of technology-rich, inquiry-based projects, some parents and educational leaders get nervous. A supportive and continuous relationship with Galileo Network teachers over an extended period of time is perceived by classroom teachers and school administrators to be an essential condition for achieving transformed teaching practices with technology. The Galileo Network recognized early on that in order to transform classroom teaching, they had to work at all levels of the educational system at once. To that end, the Galileo Network has formed strategic alliances with the provincial ministry of education, superintendents of schools, district technology and curriculum leaders, school-based administration, school teachers, parents and students to support the growth of innovative practices in schools. Educators can often be under intense pressure from the public, the ministry, the school board, their administrators, and even from themselves, to change practices and processes overnight. However, the pressure to change quickly is an unrealistic expectation, and Galileo teachers help classroom teachers to set realistic and achievable goals for inquiry-based learning and technology integration.

Creating Supportive Environments for Risk-Taking and Knowledge Creation

When asked to describe the nature of their on-site relationships with each teacher or group of teachers, co-founders Dr. Pat Clifford and Dr. Sharon Friesen explained that the work with teachers

> *...really showed us very clearly that there is no model for doing this...it's not models that make a difference, it's ideas that make a difference and it's relationships that make a difference. So it's in hearing what people want to do. It's just like teaching in a classroom where you work literally from where people are ... because people can't be in any other place than where they are. You can't wish them to be somewhere else. They are where they are from the start. And so you listen to that.. where's your opening? And then around the opening they provide you, the job of the expert then, we think, is to say what could we put in place for this person, given who they are, what they want to accomplish, and what they're working with? So it looks different, as it ought to, for each person. We called it being responsive and.. it's actually to say if you're going to have people work with kids in this way, you have to provide them, as teachers, a learning experience that's like that.*

The intent of the Galileo Network initiative is to model transformed approaches to leadership, teaching and learning that inspire and foster inquiry in learners of all ages. Pat and Sharon believe that...

> *...the work we do here, it's not without huge impact and it's not about individuals. It's far bigger than any individual. You are equal to get involved in it. You have to let it go. It's the gift you give to people. But they pick it up in ways that you don't anticipate. It's far bigger than any person. So we may work with the people, but what we put them in touch with is a part of themselves that, I think, they're often apt to give up when they enter the classroom. And once they get a hold of it, they don't want to let go because they see the impact. It's right in front of their face. You see what's happening to those kids.*

An ongoing and sustained relationship with a Galileo Network teacher provided some teachers with a safe and caring environment for exploring new approaches to teaching, and the motivation to continue when faced with questions and challenges from parents and other colleagues. For many teachers, the fact that Galileo teachers had been where they wanted to go was an important motivator for getting involved, and taking the necessary risks to change their teaching practice. Whether or not changes to practice are sustainable has a great deal to do with the ongoing nature of the relationship between teachers and the Galileo Network. Teaching practices are developed over years of experience with children, and years of observations in classrooms – hence, they are rarely transformed quickly. For a teacher to transform practices that have become comfortable, to abandon methods that have enabled

her/him to achieve some form of results with children, the teacher needs ongoing support and professional dialogue with other teachers who understand her/his concerns, and can provide images of how it can work with children. The teacher has to trust that the changes being made offer some relative advantage over what is being done right now.

Inquiry Based Learning With Technology

What is the nature of change that occurs when meaningful partnerships are formed between learners and digital media? Teachers who designed and implemented inquiry projects emphasized the importance of student questions versus teacher questions. One of the desired learning goals for teachers was to promote student's meaningful and personal connections to the topic of study. Instead of designing integrated units or students' projects with pre-determined outcomes, inquiry projects were designed in such a way that students' ideas, questions and prior knowledge became an important contribution, and an assessment strategy was developed that accommodated multiple outcomes. Students made choices about questions that they would pursue in the context of the inquiry project, and formed collaborative groups based on shared interests rather than teacher-formed groups. Learning tasks were big and complex enough that students needed to rely on each other to gather the information needed to solve problems and generate solutions. Students shared their ideas and knowledge with their peers, not just with the teacher. Students were encouraged to use a variety of means to demonstrate their understanding of concepts and problems, from textual explanations, concept maps, and drawings to dramatizations, multimedia presentations, functional robots and web sites.

Teachers rarely used whole class instruction as a method of delivering the curriculum. In response to the student's emerging learning needs, the teacher's role became one of scholarly mentor and guide as she met with groups of students for discussion about specific problems, and with individual students who needed assistance. Within the context of a well-structured and challenging inquiry project, and with readily available guidance and instruction as they needed it from the teacher, students worked collaboratively with their peers to design creative, innovative and diverse projects. Instead of there being one best solution to a complex problem posed by the teacher, students were given the license to design alternate and unique interpretations and projects, and inquire into topics and questions that reflected their own interests, knowledge and understanding.

Different groups of students required different technology tools to create their designs and construct their projects. Technology skills were taught just-in-time in service of learning tasks and goals, rather than taught to the whole class at once. One group might need a spreadsheet program to model their data, while another group may choose to represent their understanding of relationships between concepts using a semantic mapping tool. To the extent possible, given the design and resources of the school, computers were at hand wherever and whenever the students needed them, rather than walking students down the hall to a computer lab for a booked amount of time each day. Novel solutions were created in schools where there were only 2 – 4 workstations available in the classroom. For example, at one elementary school, teachers negotiated arrangements whereby students could use computers distributed throughout the school and in other classrooms as needed for their projects. A culture of inquiry was created in this particular school such that students were trusted to work where they needed to be for their inquiry tasks and projects, and appropriate behavior was continuously demonstrated.

Among educators in Galileo schools, there was a monumental shift in the perception of the role of technology in teaching and learning. Through professional dialogue, mentoring and working alongside teachers with their students, the Galileo Network has facilitated a changed understanding of the intent and fundamental goals of Alberta Learning's ICT Program of Studies, from an initial perception of an emphasis on technology, to an understanding of the emphasis on higher order thinking, inquiry, communicating, problem solving, and decision making. Teachers clearly regarded Galileo's vision and methods as a focus on teaching and learning, which was a shift from their initial perception that GENA was all about technology.

Developing A Culture of Inquiry for Teachers

The Galileo Network worked with people at all levels of the educational organization in order to help build a culture that supports and expects reformed ways of teaching and learning with ICT. A social and political culture of reform and innovation, and the expectation that people would be charting new territory, helped to support teachers in making changes to their practice. An integral component of the culture of expectation in each of these schools was the support for change provided by regular access to onsite support and expertise, and the time to make optimal use

of the onsite professional development. Teachers felt energized and excited about the changes to their practice, and were convinced by evidence of student ownership, joy and success in their learning. There were many reasons why schools and teachers first became involved, and then were highly motivated to continue, with the Galileo Network: (1) The Galileo Network teachers have worked with children on innovative and successful technology-enhanced projects, and share many examples of high-quality scholarship achieved by students; (2) The reputations of Galileo Network staff as experts and innovators, and the personal relationship networks that these experienced educators and managers have established in the Alberta education system, attract educators, and provide a basis on which to build trusting and productive relationships; (3) The push in Alberta to implement the ICT Program of Studies provides an important source of motivation; the Galileo Network bridges a professional development gap in the province with regard to achieving the expected ICT learning outcomes with students; (4) Teachers' desire for continuous professional development, and support while implementing a new program of studies, makes them highly value the opportunity to rediscover the learner and scholar within, and cherish the opportunity to work with dynamic, approachable and trusted Galileo colleagues; (5) The satisfaction of being involved with an innovative organization, and working side-by-side with energetic, enthusiastic and experienced Galileo Network teachers; (6) After participating in single or multiple projects with Galileo Network staff, the satisfaction of achieving higher results with students is a motivating factor for continued participation.

Indicators of Success

The ***first*** indicator of success is the continued demand for Galileo Educational Network's services. There is a great demand from schools all over the province to get involved in the Galileo Educational Network. In it's third year of operation, the Galileo Network initiative is growing from the current 9 schools in five school divisions to working in 18 schools in 7 different school districts in 2001/2002. A ***second*** indicator used to evaluate the success of the initiative is corporate investment in co-developing an online professional development service, Intelligence Online (IO), to extend and grow the Galileo Network's capacity to provide support to teachers. A ***third*** indicator used to assess whether the Galileo Network has been successful in achieving their objectives is stakeholder satisfaction. Overall, it can be reported with confidence that there were very high levels of satisfaction among stakeholders at every level of the Galileo Network initiative. Conversations with Galileo Network staff and school administrators yielded positive indications that key school board personnel are not only satisfied, but are actively developing strategies to spread the Galileo Network initiative to other schools in their division. A ***fourth*** indicator used to assess whether the Galileo Network has been successful in achieving their objectives is evidence of engaged student learning. Instead of designing integrated units or students tasks that had pre-determined outcomes, teachers designed projects in such a way that students ideas, questions and prior knowledge become an important contribution, and developed assessment strategies that responded to multiple ways of being right. Experienced teachers became convinced of the value of an inquiry-based approach to technology integration when they observed the enthusiasm, interest and independence of their students. Teachers and school administrators commented on how learning was enhanced for students of diverse abilities, and that the quality of work achieved by many students went well beyond their expectations. A ***fifth*** indicator used to assess whether the Galileo Network has been successful in achieving their objectives is evidence of transformed teaching practice. The professional development support provided by the Galileo Network is much less about technology integration, per se, and is instead focused more on inquiry into fundamental teaching and learning issues. Teachers appreciated having ongoing contact with a Galileo teaching colleague who has lived experience with integrating technology with children and can assist in pedagogical, project and technology skill development. Teachers critically examined their practice and determine next steps for pushing their practice forward with the onsite support of the Galileo Network.

CONCLUSIONS

Sustaining learning environments that enable technology-infused, inquiry-based approaches to teaching require that a number of essential conditions in the school be maintained, of which this is a non-exhaustive list: (1) Supportive Leadership; (2) A Learning, Risk-Taking Culture Among Staff; (3) A Colleague, From Within Or Without, To Walk This Road With You; (4) Ubiquitous Access To Reliable Technology; (5) Time For Professional Dialogue And Connections; And (6) School Board And Parent Support. A number of essential conditions for the sustainability of the Galileo Network initiative within a school emerged from conversations with school leaders, classroom teachers and Galileo staff. Among these were: (1) Securing Sustainable Sources of Funding, (2) Building On-Site Capacity And Leadership, (3) Diffusion Of The Mentorship Relationships, and (4) Designing Learning Communities to Resist the Urge To Turn Back.

Key Factors that contributed to the success of the Galileo Educational Network initiative during the 2000/2001 can be summarized as follows: (i) the vision, commitment and credibility (i.e., reputation) of the founding members of the Galileo Educational Network; (ii) the effective enculturation and professional development of new staff who join the Galileo Educational Network (i.e., cultivation of a learning organization); (iii) an organization-wide vision and mandate for transformational leadership and educational reform in the area of technology integration for teaching and learning; (iv) authentic examp les and images of best practice and engaged learning to share with school teachers; (v) active involvement of Galileo staff in teaching, coaching and mentoring within the classroom context; (vi) open and clear communication with, and support from, district and school administration; (vii) willingness and preparedness of school staff members to examine practice and to try new approaches to teaching and learning; (viii) maintenance and growth of a research agenda, and a mutually beneficial relationship with Alberta universities and research partners; (ix) the simultaneous development and cultivation of mutually beneficial relationships with key personnel at the school board/district level, the school level, and with corporate, public and private partners; (x) strategic leverage of existing district structures and personnel; (xi) widespread satisfaction of participant stakeholders at all levels of the initiative; (xii) a professional development model that is responsive to the needs and differences within and between school districts and schools; (xiii) ability to be innovative, flexible and responsive to stakeholders because the Galileo Network operates as an autonomous organization that is not subject to the political or bureaucratic constraints of any one educational, corporate, public or private partner; (xiv) building and extending upon innovative ideas, creative solutions and information on latest trends through strategic alliances with critical and political friends, corporations, public and private organizations within and beyond education; (xv) a focus on school-wide initiatives that permit buy-in as teachers feel able and willing to participate.

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